

TRAILINA, Ye.P.; ZELENTSOV, V.V.; SAVICH, I.A.; SPITSYN, Vikt.I.

Solubility products of inner-complex compounds of copper, nickel,  
and uranium with 8-hydroxyquinoline. Zhur.neorg.khim. 6 no.9:  
2048-2051 S '61. (MIRA 14:9)

(Organometallic compounds)

AFONSKIY, N.S.; SPITSYN, Vikt.I.

Synthesis and some properties of rubidium triand tetrachromate.  
Zhur.neorg.khim. 6 no.10:2416-2417 0 '61. (MIRA 14:9)

1. Moskovskiy gosudarstvennyy universitet imeni M.V.Lomonosova  
kafedra neorganicheskoy khimii.  
(Rubidium chromate)

SPITSYN, Viktor Ivanovich

Achievements in the field of chemistry in Russia. Nauka Polska 9  
no.3:23-67 '61.

1. Członek rzeczywisty Akademii Nauk SSSR.

S/076/61/035/003/007/023  
B121/B203

AUTHORS: Kovba, L. M., Ippolitova, Ye. A., Simanov, Yu. P., and  
Spitsyn, Vikt. I.

TITLE: Study of the crystalline structure of uranates. I. Uranates  
with tetragonal  $(\text{UO}_2)_2\text{O}_2$  layers

PERIODICAL: Zhurnal fizicheskoy khimii, v. 35, no. 3, 1961, 563-568

TEXT: The authors produced single crystals of  $\alpha\text{-Li}_2\text{UO}_4$  and  $\beta\text{-Na}_2\text{UO}_4$ , and determined the periods of their unit cells. It was not possible to produce K-, Rb-, and Cs monouranates in the form of single crystals; therefore, they were studied by the powder method only. The studies were made with PKOF (RKOP) and PKA (RKD) X-ray cameras of the NIIF MGU (NIIF MGU (Scientific Research Institute of Physics of Moscow State University)).  $\alpha\text{-Li}_2\text{UO}_4$  single crystals were obtained by fusing  $\text{U}_3\text{O}_8$  together with anhydrous lithium chloride, and  $\beta\text{-Na}_2\text{UO}_4$  single crystals by fusing  $\text{U}_3\text{O}_8$  with a mixture of sodium carbonate and sodium chloride. It was found that  $\alpha\text{-Li}_2\text{UO}_4$  and

Card 1/2 ✓

g/076/61/035/003/007/023  
B121/B203

Study of the ...

$\beta$ - $\text{Na}_2\text{UO}_4$  crystallized rhombically and had the following lattice parameters:  
 $\alpha$ - $\text{Li}_2\text{UO}_4$ :  $a = 6.06$ ;  $b = 5.13$ ;  $c = 10.52$ ;  
 $\beta$ - $\text{Na}_2\text{UO}_4$ :  $a = 5.97$ ;  $b = 5.795$ ;  $c = 11.68$ . Potassium-, rubidium-, and cesium monouranates belong to the structural type  $\text{K}_2\text{NiF}_4$  (tetragonally body-centered),  $\beta$ - $\text{Na}_2\text{UO}_4$  may be regarded as a rhombically distorted  $\text{K}_2\text{NiF}_4$  structure. The authors discussed the arrangement of alkali metals in monouranate single crystals. The uranyl oxide lattice of  $\beta$ - $\text{Na}_2\text{UO}_4$  is maintained in  $\alpha$ - $\text{Li}_2\text{UO}_4$ , but a different arrangement of alkali metal atoms is more likely in  $\alpha$ - $\text{Li}_2\text{UO}_4$ . The structures of lithium, sodium, and potassium monouranates determined are not identical with those indicated by W. H. Zachariasen (Ref. 4: Manch. Pr. Report CP-2611, p. 14). The authors explain this disagreement with the polymorphous properties of uranates. There are 3 tables and 11 non-Soviet-bloc references. The two references to English-language publications read as follows: W. H. Zachariasen, Manch. Pr. Report CP-2611, p. 14; W. Wait, J. Inorgan. and Nucl. Chem., 1, 309, 1955.

Card 2/2

Moscow State U,

KOVBA, L.M.; POLUNINA, G.P.; IPPOLITOVA, Ye.A.; SIMANOV, Yu.P.;  
SPITSYN, Vikt.I.

Study of the crystalline structure of uranates. Part 2: Uranates  
containing uranyl oxygen chains. Zhur. fiz. khim. 35 no. 4:719-  
722 Ap '61. (MIRA 14:5)

1. Moskovskiy gosudarstvennyy universitet im. M.V. Lomonosova,  
kafedra neorganicheskoy khimii.  
(Uranates)

VOYTEKH, O.; SPITSYN, Vikt.I., akademik

Effect of an organic solvent on the separating capacity of  
 $\alpha$ -hydroxyisobutyric acid. Dokl. AN SSSR 136 no.2:339-341 '61.  
(MIRA 14:1)

1. Moskovskiy gosudarstvennyy universitet imeni M.V. Lomonosova.  
(Isobutyric acid) (Rare earths)

S/020/61/137/003/023/030  
B101/B208

AUTHORS: Balandin, A. A., Academician, Vikt. I. Spitsyn, Academician,  
Dobrosel'skaya, N. P., and Mikhaylenko, I. Ye.

TITLE: Radioactive catalysts. Dehydration of cyclohexanol on  
magnesium sulfate and calcium chloride

PERIODICAL: Doklady Akademii nauk SSSR, v. 137, no. 3, 1961, 628-630

TEXT: The authors reported in a previous paper (Ref. 1: DAN, 121, 495, (1958)) that catalytic dehydration of cyclohexanol was affected by the presence of  $S^{35}$  in the catalyst ( $MgSO_4$ ). They have now made a study of the effect of the radiant energy of the isotope on the yield at constant absolute activity of the radioactive catalyst. To compare it with the effect of  $S^{35}$  ( $E_{max} = 0.167$  Mev) a beta-emitter,  $Ca^{45}$  ( $E_{max} = 0.254$  Mev), was chosen again.  $Ca^{45}$  was obtained by irradiating  $CaCO_3$  enriched with  $Ca^{44}$  with slow neutrons ( $0.8 \cdot 10^{13}/cm^2 \cdot sec$ ). The resultant radioactive

Card 1/6



S/020/61/137/003/023/030  
B101/B208

Radioactive catalysts. Dehydration ...

isotopes were identified with a scintillation spectrometer equipped with a 100-channel-pulse height analyzer. The presence of  $\text{Ca}^{45}$  was confirmed. The low gamma activity (0.010 mg.equ Ra per g  $\text{CaCO}_3$ ) was due to an  $\text{Fe}^{59}$  impurity.  $\text{CaCO}_3$  was dissolved by adding 18% HCl, and  $\text{CaCl}_2$  was annealed at 400°C. The absolute activity of  $\text{CaCl}_2$  was measured by an end-window counter and a 4π counter. Cyclohexanol was dehydrated by a mixture of  $\text{MgSO}_4 + \text{CaCl}_2$ .  $\text{MgSO}_4$  was wetted with a certain amount of a solution of radioactive and inactive  $\text{CaCl}_2$ , and heated to 400°C within 2 hr. Table 1 gives the characteristics of the catalysts applied. Dehydration took place at 350-420°C in an apparatus described in Ref. 1. The content of unsaturated hydrocarbons was determined bromometrically in the reaction products collected in the water-cooled receiver. Pure  $\text{MgSO}_4$  proved to be the most active catalyst. Addition of inactive  $\text{CaCl}_2$  reduces its activity. Pure  $\text{CaCl}_2$ , both the active and the inactive one, was completely

Card 2/6

S/020/61/137/003/023/030  
B101/B208

Radioactive catalysts. Dehydration ...

inert. On the other hand, all mixtures containing  $\text{Ca}^{45}$  showed an increased catalytic activity as compared with mixtures containing the same amount of inactive Ca. These results are presented in Fig. 2. The numbers correspond to those of the catalysts in Table 1. The radioactive catalysts are denoted by an asterisk. It is concluded that the  $\beta$ -radiation of the isotope does not influence the dehydration kinetics, and that  $\text{MgSO}_4$  is excited by the  $\beta$ -particles and by secondary electrons knocked-out by them. Fig. 3a represents the degree of cyclohexanol conversion as a function of the logarithm of the specific activity of the catalyst, and compares it with the data obtained in Ref. 1 for  $\text{MgSO}_4 + \text{Na}_2\text{SO}_4$  containing  $\text{S}^{35}$ . Fig. 3b shows the degree of conversion as a function of radiant power. The increased degree of conversion in the presence of  $\text{Ca}^{45}\text{Cl}_2$  is said to be due to the higher energy of its  $\beta$ -particles. There are 4 figures, 1 table, and 1 Soviet-bloc reference.

Card 3/6

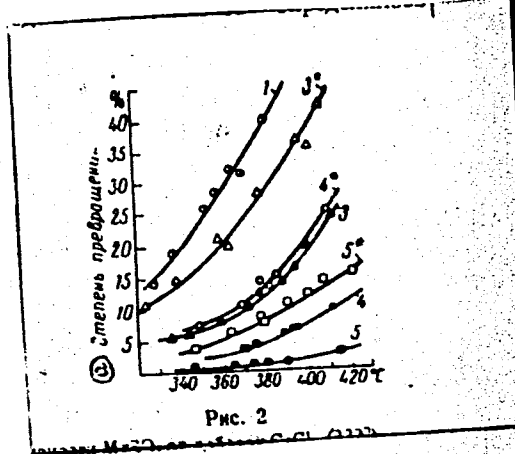
Radioactive catalysts. Dehydration ...

S/020/61/137/003/023/030  
B101/B208

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute of Physical Chemistry of the Academy of Sciences USSR)

SUBMITTED: December 24, 1960

Fig. 2. Effect of radioactive radiation of the catalyst upon its catalytic activity.  
Legend: (a) Degree of conversion.



Card 4/6

SPITSYN, Vikt.I., akademik; PCHELKIN, V.A.; GONCHAROV, I.V.

Effect of surface active agents on the solution kinetics of calcium carbonate in mineral acids. Dokl.AN SSSR 137 no.5:1158-1161 Ap  
'61. (MIRA 14:4)

(Surface active agents) (Calcium carbonate)  
(Solution (Chemistry))

SPITSYN, Viktor I., akademik; ZIMAKOV, I.Ye.

Effect of radioactive radiation from  $Y^{90}$  and  $Y^{91}$  on the solubility  
of yttrium hydroxide. Dokl. AN SSSR 138 no.1:130-132 My-Je '61.  
(MIRA 14:4)

1. Institut fizicheskoy khimii AN SSSR.  
(Yttrium--Isotopes) (Yttrium hydroxide) (Solubility)

BELIAKOVA, L.D.; GROMOV, V.V.; KISELEV, A.V.; SPITSYN, Vikt.I., akademik

Adsorption of hexane and benzene vapors on nonradioactive and  
radioactive barium sulfate samples. Dokl.AN SSSR 138 no.5:1139-  
1142 Je '61. (MIRA 14:6)

1. Institut fizicheskoy khimii AN SSSR i Moskovskiy gosudarstvennyy  
universitet im. M.V.Lomonosova.  
(Barium sulfate) (Sulfur—Isotopes) (Adsorption)

25725

S/020/61/139/003/024/025  
B127/B206

5.4600

15.2141

AUTHORS:

Spitsyn, Vikt. I., Academician, and Zimakov, I. Ye.

TITLE:

Effect of radioactivity of molybdenum anhydride on the rate of its evaporation

PERIODICAL:

Akademiya nauk SSSR. Doklady, v. 139, no. 3, 1961, 654-657

TEXT: For their studies the authors used preparations of molybdenum anhydride containing  $\text{Mo}^{99}$  (half-life period 68.3 hr) which emits  $\beta$ -particles of high energy ( $E_{\text{max}} = 1.23 \text{ Mev}$ , 85 %). The specimens had a specific activity of 1.0-28.0 millicuries/g. A mixture of calculated amounts of highly active and inactive  $\text{MoO}_3$  was converted with ammonia into ammonium molybdate; the solution was evaporated and annealed with small amounts of nitric acid to prevent the reduction of hexavalent Mo through ammonia. The  $\text{MoO}_3$  obtained was mixed with small amounts of  $\text{Nb}_2\text{O}_5$  and  $\text{ZrO}_2$ , and sublimated at  $850^\circ\text{C}$  in a weak air current for purification from radiochemical admixtures. The particle size was 0.25-0.5 mm.

Card 1/5

25725

S/020/61/139/003/024/025  
B127/B206

Effect of radioactivity of molybdenum...

Working method: A dry current of air was conducted through the layer of molybdenum powder at a rate of 8 ml/min and 700°C temperature. Every 15 min, the quartz crucible was removed, cooled, weighed, and again suspended in the tube. Table 1 shows the experimental results. The following dependence between rate of evaporation and radioactivity was established: At a specific activity of  $\text{MoO}_3$  of 2.5-3 millicuries/g, the rate of evaporation equals the inactive specimen. At a specific activity of 2.5-4 millicuries/g, a drop of the rate of evaporation was established. At 4-9 millicuries/g, a fast increase of the rate of evaporation was observed, which was retarded at a further increase of the specific activity. An increase of the electric charge on the surface was observed on the basis of  $\beta$ -particle emission. It probably also had an effect on the rate of evaporation, which becomes obvious in an interaction between the surface of the hard substances and the gaseous molecules. In the  $\text{MoO}_3$  molecule, the Mo is surrounded by three negatively charged oxygen atoms. The positive charge of the solid  $\text{MoO}_3$  prevents, therefore, transition into the vapor phase. The following experiment was made for explanation: In a crucible with radioactive  $\text{MoO}_3$ , an earthed platinum

Card 2/5



25725  
S/020/61/139/003/024/025  
B127/B206

Effect of radioactivity of molybdenum...

wire was brought directly to the specimen. The results in Figs. 3 and 4 confirm the assumption that the electric charge causes the retardation of the rate of evaporation at 2.5-4 millicuries/g. The increase of the rate of evaporation of  $\text{MoO}_3$  above 4-5 millicuries/g depends on the radiation effects in the gaseous phase. A strong flow of  $\beta$ -particles ionizes the evaporated molecules to  $\text{MoO}_3^+$  which repel themselves from the surface. The surface of the crystals is changed through radioactive radiation. The electron-microscopic pictures showed a surface for  $\text{MoO}_3$  entirely different from that for  $\text{MoO}_3$  which is full of irregularities, elevations, and depressions, the size of which depends on the strength of the specific radioactivity. It is also pointed out that the rate of evaporation begins to increase only at doses  $> 10^{16}$  ev/g-sec in the case of an external irradiation of  $\text{MoO}_3$  by an electron current of 800 kev. There are 4 figures, 1 table, and 14 Soviet-bloc references.

Card 3/5

Effect of radioactivity of molybdenum...

25725  
S/020/61/139/003/024/025  
B127/B206

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute of Physical Chemistry, Academy of Sciences USSR)

SUBMITTED: April 12, 1961

Table 1. Rate of evaporation of  $\text{MoO}_3$  as a function of the specific radioactivity of preparations.

Legend: (1) Number of the preparation; (2) specific radioactivity, millicuries/g; (3) amount of  $\text{MoO}_3$  (mean value) evaporated in 2 hr, grams; (4) observed deviation from the mean value, %.

1	2	3	4	5	6	7	8
№	Удельн. радиоактивн. мКи/г	Колич. испаривш. за 2 часа $\text{MoO}_3$ (средн.), г	Наблю-давш. отклон. от средн. %	№	Удельн. радиоактивн. мКи/г	Колич. испаривш. за 2 часа $\text{MoO}_3$ (средн.), г	Наблю-давш. отклон. от средн. %
1	Неак-тивный	0,1240	5,0	7	5,0	0,1148	3,5
2	1,0	0,1240	6,0	8	7,0	0,1458	5,0
3	2,0	0,1240	5,1	9	8,4	0,1514	7,0
4	2,5	0,1217	6,0	10	10,0	0,1556	4,5
5	3,0	0,1184	5,0	11	14,0	0,1600	5,0
6	4,0	0,1125	5,0	12	20,0	0,1623	6,0
				13	28,0	0,1669	6,0

Card 4/5

25860  
S/020/61/139/004/020/025  
B103/B220

18.3100

AUTHORS:

Spitsyn, Vikt. I., Academician, Komissarova, L. N., and  
Men'kov, A. A.

TITLE:

Production and properties of metallic scandium

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 139, no. 4, 1961, 903-906

TEXT: The production of metallic scandium from its anhydrous chloride  $\text{ScCl}_3$  was studied, and its still little known properties were analyzed. The relatively high melting point of  $1539^\circ\text{C}$ , low specific gravity, considerable mechanical strength, and (under certain conditions) low chemical activity render scandium a promising material in several fields of modern technology. Spectroscopically pure scandium oxide obtained by thiocyanate extraction and precipitation of scandium oxalate from commercial  $\text{Sc}_2\text{O}_3$  was used as initial substance to produce Sc. Anhydrous  $\text{ScCl}_3$  was obtained by chlorination of the mixture scandium oxide + charcoal from sugar (3:1) in a quartz tube at  $1000^\circ\text{C}$ , and sublimed. It was reduced with metallic

Card 1/5

25860  
S/020/61/139/004/020/025  
B103/B220

Production and properties of metallic ...

calcium in pure argon at  $900^{\circ}\text{C}$ . The reaction mixture containing about 5% Ca was filled into a tantalum crucible. The reaction products contained Ca,  $\text{CaO}$ ,  $\text{ScCl}_3$ , and Si. They were pulverized (grain size  $<0.2$  mm), treated with water, with 10% NaOH, again with water, and finally with methanol and ether. The solvent was decanted. The powdery metallic scandium obtained was dried in air (10-15min) and in vacuo ( $10^{-4}$  mm Hg,  $\sim 30$  min). Then, scandium was melted at reduced argon pressure (200 mm Hg) in an arc furnace. Previously, the metal had been pressed into tablets under a pressure of  $100 \text{ kg/cm}^2$ , and heated in high vacuum ( $10^{-5} - 10^{-6}$  mm Hg). The molten metallic scandium is a silvery metal with a characteristic yellow glimmer. It contains 97 - 97.5% Sc (analysis by the hydrogen method), whereas the gravimetric and volumetric methods gave corresponding values of 98 - 99% by weight. Small quantities of Si (0.1% by weight) and Ca (0.001%) were spectroscopically identified in most specimens. The analysis of molten Sc yielded in %: Sc 98 - 99; Cl  $<0.05$ ; Ca  $<0.001$ ; Si 0.1;  $\text{O}_2$   $<0.9$ . Zr, Th, Y, Yb, Fe in total  $<0.1$ . For further purification molten Sc was sublimed in high vacuum from a tantalum crucible to a

Card 2/5

25860  
S/020/61/139/004/020/025  
B103/B220

Production and properties of metallic ...

tantalum plate at 1500-1600°C by using a high-frequency apparatus with tube generator. The Sc content in the sublimate was <99%. Radiographs of Sc sublimed in vacuo were analyzed. All 29 lines of the picture were easily indicated in an Mg-type hexagonal lattice with  $a = 3.302 \pm 0.005$  kX and  $c = 5.255 \pm 0.005$  kX,  $c/a = 1.591$ ;  $Z = 2$ . The radiographic density is  $2.992 \text{ g/cm}^3$ , the pycnometric density =  $3.0 \text{ g/cm}^3$ . The cubic phase described in Ref. 13 (K. Meisel, Naturwiss., 27, 230 (1939)) and Ref. 6 (J. C. Achard et al., C. R., 243, 493 (1956)) is explained as being due to considerable impurities, mainly ScN, in the Sc metal. The device with diamond pyramid was used for determining the microhardness. For Sc 97%, it was  $75 \pm 5 \text{ kg/mm}^2$ , whereas  $145 \pm 10 \text{ kg/mm}^2$  was measured for Sc 97.5%. Further data refer to Sc 97 - 97.5%. The yield strength was determined on turned specimens of 2 mm diameter by means of a tensile-testing machine. The yield strength decreases considerably with increasing content of non-metallic additions. The stability in air was tested (a) isothermally at 20°C, and (b) polythermally between 20 and 800°C. Ad (a): A damped quartz balance was used (with assistance of V. A.

Card 3/5

25860  
S/020/61/139/004/020/025  
B103/B220

Production and properties of metallic ...

Arslambekov, Institut fizicheskoy khimii AN SSSR, Institute of Physical Chemistry AS USSR). The tests showed that the metal surface was coated by an oxide film ~600 Å thick, whereupon oxidation stopped. Ad (b): Oxidation in air was studied by using a continuous balance. Metal powder (<0.2 mm) begins to oxidize at 250°C. The kinetics of interaction with aqueous HCl solutions was recorded on Sc plates (apparent surface 3-4 cm<sup>2</sup>, weight 0.3 - 0.5 g) based on the rate of H<sub>2</sub> separation, and checked by the decrease in weight of Sc. The two methods gave corresponding data. Interaction between metallic Sc and HCl solutions occurs rather rapidly at HCl concentrations between 0.05 and 0.1 N and more. If the concentration of HCl is reduced, the dissolution of metal is rapidly showed down. In 0.001 N HCl (pH 3), the dissolution constant K is very low (<5·10<sup>-5</sup> mg/cm<sup>2</sup>·min). Consequently, the authors state that practically no further dissolution of Sc takes place at this concentration, and the more so in H<sub>2</sub>O. Yu. P. Simanov is thanked for discussing data obtained by X-ray analysis. There are 4 figures, 1 table, and 16 references: 6 Soviet-bloc

Card 4/5

Production and properties of metallic ...

25860  
S/020/61/139/004/020/025  
B'03/B220

and 10 non-Soviet-bloc. The most important references to English-language publications read as follows: Ref. 7: Chem. Age 82, 2106, 742 (1959); Ref. 9: F. H. Spedding & al. Trans Metallurg. Soc. AIME 218, No. 4, 608 (1960).

ASSOCIATION: Moskovskiy gosudarstvenny universitet im. M. V. Lomonosova  
(Moscow State University imeni M. V. Lomonosov)

SUBMITTED: April 15, 1961

Card 5/5

27266

S/020/61/139/005/020/021  
B103/B208

5.4600  
AUTHORS:

Spitsyn, Vikt. I., Academician, Zemlyanova, L. I.,  
Mikhaylenko, I. Ye., Gromov, V. V., and Zimakov, I. Ye.

TITLE:

Electron-microscopic examination of the effect of radio-  
active radiation of solids on the structure of their surface

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 139, no. 5, 1961, 1163-1165

TEXT: The crystal lattice of solids is disturbed by the ionizing action  
of their own radioactive radiation and the appearing recoil atoms, which  
also changes their surface structure. According to the authors, all this  
may be one of the causes of the effect exerted on physicochemical  
properties of solids by their own radiation (sorptive power, solubility  
in water, kinetics of heterogeneous processes of isotopic exchange,  
catalysis, etc.). The authors made electron-microscopic studies of the  
surface structure of radioactive samples of  $K_2SO_4$ ,  $MgSO_4$ ,  $BaSO_4$  and

$MoO_3$  which had been used previously to study adsorption, catalysis and  
isotopic exchange. Except for  $BaSO_4$ , the pictures were obtained by

Card 1/5



27266

S/020/61/139/005/020/021  
B103/B208

Electron-microscopic examination...

replication, and for  $\text{BaSO}_4$  the method of double replicas (silver quartz replicas) was used.  $\text{K}_2\text{SO}_4$ ,  $\text{MgSO}_4$  and  $\text{MoO}_3$  were applied to a collodion film in the form of a fine powder. A 200 - 300 Å thick quartz layer was sputtered onto it in vacuo. After dissolution of collodion in amyl acetate, the quartz replica were rinsed in distilled water in the case of  $\text{K}_2\text{SO}_4$  and  $\text{MgSO}_4$  and in dilute alcohol in the case of  $\text{MoO}_3$ . Radioactive samples of K and Mg were obtained by adding small amounts of  $\text{Na}_2\text{SO}_4$  containing  $\text{S}^{35}$ .  $\text{BaSO}_4$  precipitates were isolated by a method previously described by Vikt. I. Spitsyn, V. V. Gromov (DAN. 123, 722 (1958); Radiokhimiya, 1, 181 (1959)). Radioactive  $\text{MoO}_3$  was obtained by adding an  $\text{Mo}^{99}$  containing sample to ordinary  $\text{MoO}_3$  in order to attain the necessary specific radioactivity. The mixture was converted to ammonium molybdate by treating it with aqueous ammonia; it decomposed when heated. The resultant  $\text{MoO}_3$  was sublimed at 850°C. When comparing the pictures (magnification: 12,000 times) [Abstracter's note: Not reproducible] the

Card 2/ 5

27265

S/020/61/139/005/020/02:  
B103/B208

Electron-microscopic examination...

authors found the following differences in the crystal surface of a) radioactive and b) non-radioactive samples: 1) The surface of b) is comparatively smooth, that of a) highly pitted. The crystal surface of  $\text{BaSO}_4$  is changed to a high extent by incorporation of small radium amounts.  $\text{K}_2\text{SO}_4$ ,  $\text{BaSO}_4$ , and  $\text{MoO}_3$  also show some changes in their surface structure after an external irradiation with 800-kev electrons. Although the dose was much higher in this case, the changes were less pronounced than those caused by radioactive radiation. The above surface defects appear rather regularly over the whole length of the crystal of the radioactive substance. The deep cavities observed in samples irradiated with neutrons were absent. The surface changes resemble those observed in metal etched by an ion beam. The authors further conclude from the comparison of the photographs that the surface defects of the radioactive samples develop already during the separation of the solid phase from the solution or from the gas. They assume that the radiation of electrons or other charged particles during the crystallization of solid substances gives rise to a great number of new active centers (seed crystals). The particle-size distribution on separation of radioactive salts from

Card 3/5

27236

S/020/61/139/005/020/02  
B'03/B208

Electron-microscopic examination...

solutions differs from a non-radioactive preparation. The content of smaller fractions considerably increases. The authors assume that additional crystallization centers are formed directly on the surface of the radioactive salts owing to radiation. The larger crystals thus decompose, and the surface becomes looser. A dendritic structure results in some cases (after separation of  $\text{MoO}_3$  from the gaseous phase). The further

development of the surface of solids under the action of prolonged radioactive radiation reminds of the radiation corrosion rather than of the growth of irradiated crystals, as is the case in neutron bombardment. The adsorption of the radioactive samples is changed in the following ways: Radioactive samples adsorb far more vapor of methanol, benzene, and hexane per unit surface of  $\text{BaSO}_4$  precipitate than do non-radioactive samples. This is considered to prove essential differences in the surface structure between these two types of samples. There are 1 figure, 2 tables, and 16 references: 15 Soviet-bloc and 1 non-Soviet-bloc. The reference to English-language publications reads as follows: Ref. 13: H. Newkirk, J. Nucl. Materials. 2, 269 (1960).

Card 4/5

27266

S/020/61/139/005/030/021  
B103/B208

Electron-microscopic examination...

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute  
of Physical Chemistry of the Academy of Sciences USSR)

SUBMITTED: April 15, 1961

Card 5/5

SPITSYN V. I.

28652

S/020/61/139/006/019/022  
B103/B:01

5 2200

AUTHORS:

Tsirel'nikov, V. I., Komissarova, L. N., and  
Vikt. I. Spitsyn, Academician

TITLE:

Thermal conductivity and viscosity of zirconium- and hafnium  
tetrachloride vapors in the temperature range 300-700°C

PERIODICAL:

Akademiya nauk SSSR. Doklady, v. 139, no. 6, 1961, 1389-1391

TEXT: The authors determined: 1) thermal conductivity, 2) viscosity of the vapors of a) zirconium-, b) hafnium tetrachloride between 300 and 700°C. The above data are required for the development of new methods of separating a) and b). Ad 1): The apparatus used was a double furnace with dural blocks whose temperatures were measured by an automatic electronic potentiometer type ЭПН-09 (EPP-09). For measuring the thermal conductivity a platinum filament (thickness: 0.05 mm) stretched along the longitudinal axis of a pyrex tubule, was used. A platinum resistance thermometer indicating the wall temperature of the tubule, is bifilarly coiled upon it. The platinum filament is electrically heated in the atmosphere of the gas to be examined. At constant amperage, the

Card 1/6

28652

S/020/61/139/006/019/022  
B103/B101

Thermal conductivity and viscosity of...

resistance depends on the temperature of the filament and thus on the thermal conductivity of the gas. The temperature is measured in a resistance bridge. First, the resistances of platinum filament and thermometer are measured at room temperature, and then diagrams of the temperature dependence of their resistances are plotted. After placing the tubule into the furnace, the temperature difference between platinum filament and tubule walls as depending on the amperage of the current heating the platinum filament are measured at various wall temperatures, either in vacuo ( $10^{-3}$  mm Hg), or in dry hydrogen. Then, the tubule is filled with powdery (a) or (b), is evacuated to  $10^{-3}$  mm Hg, sealed, and again put into the furnace. The lower block is heated up to  $300-320^{\circ}\text{C}$ . At this temperature, the vapor pressures of (a) or (b) are approximately  $0.75$  atm; the thermal conductivity of the vapor is independent of the temperature. The temperature of the upper block is varied between  $350$  and  $500^{\circ}\text{C}$ . Method of measurement: at a given wall temperature between  $350$  and  $500^{\circ}\text{C}$ , the temperature of the platinum filament and the current consumption are measured. These data serve for setting up the diagrams of the dependence of  $W$  on  $\Delta T$  at given wall temperatures, and that of  $W$  on the wall temperature at constant  $\Delta T = 20^{\circ}\text{C}$ . (1) is calculated according to the

Card 2/6

28652

S/020/61/139/006/019/022  
B103/B101

Thermal conductivity and viscosity of...

$$\lambda = \frac{\lambda_1(W_2 - W_0)}{W_1 - W_0}$$

where  $\lambda_1$  is the thermal conductivity of hydrogen at the temperature concerned,  $W_0$ ,  $W_1$ , and  $W_2$  are the amperages required for generation of a temperature difference of 20°C in vacuo, in  $H_2$ , and in the vapors of (a) and (b), respectively. As expected, the coefficients of the thermal conductivities of (a) and (b) vapors increase with increasing temperature. This function is linear. The thermal conductivity of (a) is higher than that of (b). This difference increases with increasing temperature. At 300°C, the coefficients of the thermal conductivity are  $4.31 \cdot 10^5$  and  $3.67 \cdot 10^5$ ; at 500°C they are  $6.35 \cdot 10^5$  and  $4.89 \cdot 10^5$  cal/cm·sec·deg. Ad 2). The authors applied the method of vapor discharge through a capillary (Ref. 4, see below). The viscosity coefficient was calculated from the Hagen-Poiseuille equation. The values required for this: vapor pressure at inlet and outlet of the capillary; the quantity of vapor passing the capillary within a certain time, and the capillary parameters, were experimentally determined. The furnace used had a nickel and a dural block. The temperature of the nickel block was measured by an automatic

Card 3/5

28652  
S/020/61/139/006/019/022  
B103/B101

Thermal conductivity and viscosity of...

potentiometer type ЭПВ-2 (EPV-2) between 350 and 700°C, that of the dural block by a chromel-alumel thermocouple with a ПП (PP) potentiometer, and was controlled by a special system (between 250 and 350°C). The quartz phial with a capillary fused on to it, was filled with freshly sublimed (a) or (b). Method of measurement: After filling up to approximately 1/3, the phial is weighed and placed into the furnace which is heated up to a given temperature. The phial is placed into the dural block and the capillary into the nickel block. After 5-10 min, the phial is taken out, cooled down and weighed. Thus, the amounts of (a) or (b) which passed the capillary, are measured. The vapor pressures of (a) and (b) are calculated according to the equations  $\log P_{\text{mm}} = -5400/T + 11.766$  for (a), and  $\log P_{\text{mm}} = -5197/T + 11.712$  for (b). The temperature of the dural block is

chosen such as to guarantee a pressure of 200 mm Hg in the phial. The viscosity coefficient of the vapor at a given temperature of the capillary is calculated from the formula  $\eta = \frac{\pi \cdot r^4 \cdot \tau \cdot \rho}{8 \text{ ML}} \frac{P_1^2 - P_2^2}{2P_1}$  containing a

correction for the gas expansion in the capillary, with r denoting the

Card 4/6



~~SPITSYN~~, **Vikt.** I., akademik; MIKHAYLENKO, I.Ye.; PIROGOVA, G.N.

Dehydration of primary dodecyl alcohol over magnesium sulfate.  
Dokl. AN SSSR 140 no.5:1090-1092 O '61. (MIRA 15:2)

1. Institut fizicheskoy khimii AN SSSR.  
(Dodecyl alcohol)  
(Dehydration)

30030  
S/020/61/141/001/014/021  
B103/B147

21-2100

AUTHORS:

Trunov, V. K., Kovba, L. M., and Spitsyn, Vikt. I.,  
Academician

TITLE:

Double oxides in the system uranium - tungsten - oxygen

PERIODICAL:

Akademiya nauk SSSR. Doklady, v. 141, no. 1, 1961, 114-116

TEXT: The authors investigated oxides formed by interaction of uranium and tungsten oxides, as well as by thermal decomposition and reduction of uranyl tungstate by hydrogen. They used  $H_2WO_4$  and  $(UO_2)NO_3$  (chemically pure, for analysis) as initial substances from which they produced  $WO_2$ ,  $W$ ,  $UO_2$ ,  $U_3O_8$ , and  $UO_3$ . An PKA-57(RKD-57) camera was used for the X-ray phase analysis. Samples in the system  $UO_3 - WO_3$  were produced from aqueous suspensions of  $H_2WO_4$  and  $UO_2(OH)_2$  by prolonged boiling, subsequent evaporating, and 45 hr roasting at  $900^\circ C$ . It was found that only one compound,  $UO_2WO_4$ , was formed in the system  $UO_3 - WO_3$ . Uranyl chromate and molybdate were synthesized for comparison. The X-ray patterns of the three compounds were

30030  
S/020/61/141/001/014/021  
B103/B147

Double oxides in the system ...

very similar, which speaks in favor of their isostructure. Uranium and tungsten oxides of lower valencies were produced from  $UO_2WO_4$  by thermal decomposition in vacuo at 600 - 900°C, by reduction of uranyl tungstate at 300 - 800°C, and by sintering various uranium and tungsten oxides in evacuated ampuls at 1250 and 900°C (Table 1). Two new phases appeared in these oxides. One was similar in structure to  $U_3O_8$  and corresponded to  $UWO_{5+x}$ . An analogous phase was obtained by thermal decomposition of  $UO_2WO_4$  in vacuo at 800°C (total formula  $UWO_{5.5}$ ) and at 900°C ( $UWO_{5.01}$ ). The other phase showed a Debye powder pattern with cubic syngony, parameter of the primitive elementary cell  $a = 3.805 \pm 0.001$  kX. This compound was synthesized by sintering  $UO_2$  and  $WO_3$  at ratios 1:1 and 1:10. At ratios 1:25 and 1:50, the cubic cell was tetragonally distorted. When sintering  $WO_3$  and  $WO_2$  at ratios 15:1, 25:1, and 50:1, no cubic phase was formed, and the cell was rhombically distorted. Consequently, the cubic phase only forms in the presence of U. It is similar to  $WO_3$  but probably contains less oxygen,  $((W,U)O_{3-x})$ . The sample of  $UO_2 + 10WO_3$  contains a phase of the  $UO_2$  type

30030  
S/020/61/141/001/014/021  
B103/B147

Double oxides in the system...

which probably contains some W;  $a = 5.461 \pm 0.001$  kX. The cubic phase is not yet formed in the sample of  $UO_2 + 25WO_3$ . Conclusions: The ratio U:W in the cubic phase lies close to 1:15-20,  $x = 1/15-1/20$ . At higher temperature (above  $1250^\circ C$ ), the phase  $UWO_{5+x}$  disproportionates. Up to  $1250^\circ C$ , there is no interaction between  $UO_2$  and  $WO_2$ . In sintering, the lattice parameters of the initial phases do not change, i. e., no solid solutions are apparently formed. Yu. P. Simanov is thanked for advice. There are 2 figures, 1 table, and 4 references: 1 Soviet and 3 non-Soviet.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova  
(Moscow State University imeni M. V. Lomonosov)

SUBMITTED: June 12, 1961

Table 1. Results of X-ray phase analysis. Legend: (1) Initial preparation, (2) mode of treatment, (3) phases observed, (4) glow annealing, (5) decomposition in vacuo, (6) ditto.

Card 3/4

S/020/61/141/002/014/027  
B103/B110

AUTHORS: Men'kov, A. A., Komissarova, L. N., Simanov, Yu. P., and  
Spitsyn, Vikt. I., Academician

TITLE: Scandium chalcogenides

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 141, no. 2, 1961, 364-367

TEXT: High-purity  $\text{Sc}_2\text{O}_3$  (of 99.9% purity),  $\text{Sc}_2\text{S}_3$ , and  $\text{ScTe}$  (the latter two synthesized from elements) were studied by x-ray diffraction. Compounds of the composition  $\text{Sc}_2\text{O}_3$  were not found in the systems  $\text{Sc} - \text{S}$  and  $\text{Sc} - \text{Se}$ . PKA-57 (RKD-57) and PKU-86 (RKU-86) cameras with filtered  $\text{CuK}_\alpha$  radiation were used for taking x-ray photographs. Results are given in Tables 1 - 3. All  $\text{Sc}_2\text{O}_3$  lines are satisfactorily indicated in a cubic, body-centered  $\text{Mn}_2\text{O}_3$  lattice with  $a = 9.835 \pm 0.005$  kX,  $Z = 16$ , which is somewhat more than the lattice constants given in publications. The density of  $\text{Sc}_2\text{O}_3$  ( $\text{g/cm}^3$ ) determined by x-ray diffraction is 3.84, the

Card 1/03

S/020/61/141/002/014/027  
B103/B110

# Scandium chalcogenides

pycnometrically determined density is 3.75. As to their intensities,  $\text{Sc}_2\text{S}_3$  lines may be clearly classified into two groups: (1) very strong ones, (2) weak ones. The former are indicated in a primitive cubic lattice with  $a_0 = 2.591 \text{ kX}$  which represents a subcell. The latter are due to a superstructure. In analogy with the structure of  $\beta\text{-In}_2\text{S}_3$  (Ref. 12, see below); a tetragonal face-centered lattice,  $a = 10.37 \pm 0.01 \text{ kX}$  ( $a = a_0 \cdot 4$ ) and  $c = 31.11 \pm 0.03 \text{ kX}$ ;  $c/a = 3$ ,  $Z = 32$ , is assumed. The existence of lines which cannot be indicated is explained by an additional  $\text{Sc}_2\text{S}_3$  superstructure, or by small impurities. The calculated packing density of such a tetragonal lattice was  $2.96 \text{ g/cm}^3$ , the pycnometrically determined one (in chloroform)  $2.80 \text{ g/cm}^3$ . All 25 lines of the  $\text{ScTe}$  photograph are well indicated in a hexagonal  $\text{NiAs}$  lattice with  $a = 4.112 \pm 0.005 \text{ kX}$  and  $c = 6.735 \pm 0.005 \text{ kX}$ ,  $c/a = 1.634$ ,  $Z = 2$ . The density of  $\text{ScTe}$  determined by x-ray diffraction is  $5.75 \text{ g/cm}^3$ , the pycnometrically determined one (in bromoform) is  $5.65 \text{ g/cm}^3$ . The results obtained are not in agreement with those of Ref. 13 (see below). The color of Sc chalcogenide changes regularly from white to black with increasing

Card 2/ 6

020/61/141/002/014/027  
B103/B110

Scandium chalcogenides

chalcogen polarizability.  $\text{Sc}_2\text{O}_3$ : white,  $\text{Sc}_2\text{S}_3$ : yellow,  $\text{Sc}_2\text{Se}_3$ : brown-violet,  $\text{Sc}_2\text{Te}_3$ : black,  $\text{ScTe}$ : black. The crystal lattices of these chalcogenides is of high symmetry. There are 4 tables and 13 references: 4 Soviet and 9 non-Soviet. The three references to English-language publications read as follows: H. E. Swanson, R. K. Fuyat, G. M. Ugrinik, National Bureau of Standards, Circular 539, 3, 1954; C. J. M. Rooymans, J. Inorg. and Nucl. Chem., 11, no. 1, 78 (1959); L. H. Brixner, J. Inorg. and Nucl. Chem., 15, No. 1/2, 199 (1960).

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova  
(Moscow State University imeni M. V. Lomonosov)

SUBMITTED: June 24, 1961

Card 3/6 3

SPITSYN, Vikt.I., akademik; FINIKOV, V.G.; ZYKOVA, G.N.

Isotope exchange between  $O_2^{18}$  and molten  $Na_2WO_4^{16}$ . Dokl. AN  
SSSR 141 no.3:668-669 N '61. (MIRA 14:11)

1. Institut fizicheskoy khimii AN SSSR.  
(Oxygen--Isotopes) (Sodium tungstate)



GROMOV, V.V.; SPITSYN, Vikt. I., akademik

Effect of external irradiation on the sorption properties of  
Ba SO<sub>4</sub>. Dokl. AN SSSR 141 no.4:891-893 D '61. (MIRA 14:11)

1. Institut fizicheskoy khimii AN SSSR.  
(Solids, Effect of radiation on)  
(Barium sulfate)  
(Sorption)

SPITSYN, Vikt.I., akademik; MAKSIM, Ion; PIROGOVA, G.N.; MIKHAYLENKO, I.Ye.;  
KODOCHIGOV, P.N.

Effect of different ~~k~~inds of radiation on the catalytic dehydration  
of n-decyl alcohol. Dokl. AN SSSR 141 no.5:1143-1146 D '61.  
(MIRA 14:12)

1. Institut fizicheskoy khimii AN SSSR i Institut atomnoy fiziki  
AN Rumynskoy Narodnoy Respubliki.  
(Decyl' alcohol) (Radiation) (Dehydration)

32432

S/020/61/141/006/018/021  
B103/B147

54600

AUTHORS:

Zimakov, I. Ye., and Spitsyn, Vikt. I., Academician

TITLE:

Effect of radioactive energy on the evaporation rate of a solid

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 141, no. 6, 1961. 1400-1402

TEXT: This is a supplement to a previous paper by the authors on the effect of the radioactive level upon the evaporation rate of  $\text{MoO}_3$  (Ref. 1: Vikt. I. Spitsyn, I. Ye. Zimakov, DAN, 139, No. 3 (1961)), where also the production methods of  $\text{MoO}_3$  with different  $\text{Mo}^{99}$  contents were described. The effect of  $\beta$ -radiator additions such as a)  $\text{Y}^{90}$  ( $E_{\text{max}} = 2.18 \text{ Mev}$ ), b)  $\text{Mo}^{99}$  ( $E_{\text{max}} = 1.23 \text{ Mev}$ ), and c)  $\text{W}^{185}$  ( $E_{\text{max}} = 0.43 \text{ Mev}$ ) as well as the value of their radiant energy were studied. In case a),  $\text{MoO}_3$  powder was soaked with a certain quantity of dissolved radioactive yttrium nitrate (or of not radioactive yttrium nitrate as control), dried, and therefrom

Card 1/3

was determined in an electric oven from the change in the length of the quartz spring to which the specimen was fixed. A stream of dry air or nitrogen (flow rate 10 ml/min) was passed through at  $700 \pm 1^\circ\text{C}$ . The changes in the weight of the portions were noted and used for plotting evaporation curves. The evaporation rate (ER) of specimens containing non-radioactive Y and of those with an initial specific radioactivity of 1.0 and 2.0 millicuries/g is practically constant. From 3 millicuries/g onward, the ER of the non-radioactive specimens differs considerably. The ER of each specimen increases steadily, since the radioactivity of the residual preparation increases owing to  $\text{MoO}_3$  evaporation. In the case of c) this difference sets in at 5 millicuries/g. No radioactive products were found in the sublimate. The dependence of the ER of  $\text{MoO}_3$  on its specific radioactivity does not differ from that

Card 2/3

KODOCHIGOV, Petr Nikolayevich; SPITSYN, V.I., akademik, otv. red.;  
PETROV, Ye.M., red. izd-va; VOLKOVA, V.V., tekhn. red.

[Practical problems involved in the dosimetry of ionizing radiation] O prakticheskikh voprosakh dozimetrii ioniziruiushchikh izluchenii. Moskva, Izd-vo Akad. nauk SSSR, 1962. 134 p.  
(MIRA 15:7)

(Radiation—Dosage)

S/828/62/000/000/014/017  
EO71/E135

AUTHORS: Komissarova, L.N., Shatskiy, V.M., Zazubin, A.I.,  
Savrukova, G.D., and Spitsyn, V.I., Academician.

TITLE: Separation of scandium from tungsten and poor  
polymetallic iron ores

SOURCE: Razdeleniye blizkikh po svoystvan redkikh metallov.  
Mezhvuz. konfer. po metodam razdel. blizkikh po svoyst.  
red. metallov. Moscow, Metallurgizdat, 1962, 155-167.

TEXT: As a result of experiments carried out with tungsten  
residues and slag, two methods of separation of scandium and  
production of a pure scandium oxide (above 99.99%) with an overall  
yield of 80-88% production, were developed. The first stage in  
both is the transfer of scandium into solution. The best results  
were obtained by treating the residues or slag with 98% sulphuric  
acid, using a solid to liquid ratio of 1:1, a temperature of  
220 °C up to a nearly complete removal of SO<sub>3</sub> vapour (≥ 4 hours)  
and subsequent extraction with water. The solubility of Sc(OH)<sub>3</sub>  
in Na<sub>2</sub>CO<sub>3</sub> solutions of various concentrations was studied at 0  
and 25 °C. With increasing concentration of Na<sub>2</sub>CO<sub>3</sub> the solubility  
Card 1/3

Separation of scandium from tungsten... S/828/62/000/000/014/017  
E071/E135

of  $\text{Sc}(\text{OH})_3$  increases. The maximum solubility, 0.12 wt.% of  $\text{Sc}(\text{OH})_3$ , is obtained at 20 wt.% of  $\text{Na}_2\text{CO}_3$  and 25 °C. The solubility of  $\text{Sc}(\text{OH})_3$  in sodium hydroxide solutions in the range of concentration of 7-45 wt.% at 25 °C was determined. In the lower range of concentration of sodium hydroxide (up to 15 wt.%) the solubility of  $\text{Sc}(\text{OH})_3$  is insignificant ( $\sim 0.03$  mg  $\text{Sc}_2\text{O}_3$  per ml of solution). The solubility was highest at 26 and 32.5 wt.% of NaOH, 1.28 and 1.5 mg of  $\text{Sc}_2\text{O}_3$  per ml of solution. The above studies were used as a basis for the two proposed methods of separation. The carbonate method, proposed for the processing of tungsten residues, comprises: transfer into solution with concentrated sulphuric acid, sodium carbonate treatment, extraction of thiocyanides and precipitation of oxalates. The alkali-carbonate method, proposed for the separation of scandium from slags (from the production of pig iron) comprises: sulphuric acid solution, precipitation with sodium hydroxide, carbonate treatment, extraction of thiocyanides and precipitation of oxalates. As a result of the carbonate treatment 40-70%  $\text{Sc}_2\text{O}_3$  concentrates are obtained. The main admixtures are thorium, rare earth elements,

Card 2/3

Separation of scandium from tungsten... S/828/62/000/000/014/017  
E071/E135

zirconium, titanium, aluminium and beryllium.  
There are 2 figures and 7 tables.

Card 3/3

S/844/62/000/000/051/129  
D287/D307

AUTHORS: Spitsyn, V. I., Vereshchinskiy, I. V., Glazunov, P. Ya.,  
Ryabchikova, G. G. and Sibirskaya, G. K.

TITLE: High-temperature radiolysis of propane

SOURCE: Trudy II vsesoyuznogo soveshchaniya po radiatsionnoy khimii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962, 308-311

TEXT: Preliminary results are given of the effects of temperature on the radiolysis of propane-ethane mixtures. The purified propane-ethane mixture, prepared in the Institut ispol'zovaniya gazov AN USSR (Institute for the Utilization of Gases, AS UkrSSR), freed of  $\text{CH}_4$ , olefins and  $\text{C}_4$  hydrocarbons, and containing 98% propane at normal pressure, was irradiated with an optimum dosage of a few units  $\times 10^{15}$   $\text{ev/cm}^2\text{sec}$ , the temperature being maintained with an accuracy of  $\pm 4^\circ\text{C}$ . The radiolysis products (up to  $\text{C}_6$  hydrocarbons) were analyzed in a chromothermograph XT-2M (Kht-2M); the weight of

Card 1/2



S/844/62/000/000/051/129  
D287/D307

High-temperature radiolysis ...

the samples was 0.25 - 1 ml. The yields were found to increase slightly at 450°C and rapidly thereafter. Only temperatures of up to 600°C were investigated as thermal cracking occurs at higher temperatures (38% at 550°C, 46% at 600°C). Principal products obtained during radiolysis were: H<sub>2</sub>, ethylene and propylene, but no CH<sub>4</sub> at 500°C; the CH<sub>4</sub> content increased rapidly at higher temperatures. At 600°C the following reaction products were obtained: 22% H<sub>2</sub>, 29.5% CH<sub>4</sub>, 48.5% C<sub>2</sub>H<sub>4</sub> + C<sub>3</sub>H<sub>6</sub> which is approximately the same the products obtained during thermal cracking at 650°C. Investigations on the relationship between the percentage composition of the composition and the time of irradiation at 500°C showed that the products are: H<sub>2</sub> (180 mol/100 ev), ethylene (160 mol/100 ev) and propylene (135 mol/100 ev). The activation energy for the formation of hydrogen, ethylene and propylene was calculated to be 16 kcal/mole, i.e. it is approximately equal to that required for thermal cracking. The radiolysis of propane-ethane mixtures proceeds by a chain reaction. There are 4 figures.

ASSOCIATION: Institut fizicheskoy khimii, AN USSR (Institute of  
Card 2/2 Physical Chemistry, AS USSR)

S/844/62/000/000/086/129  
D423/D307

AUTHORS: Spitsyn, V. I., Afanas'yeva, N. A., Kolli, I. D., Pika-  
yev, A. K. and Glazunov, P. Ya.

TITLE: Radiation polymerization of phosphonitrile chloride

SOURCE: Trudy II Vsesoyuznogo soveshchaniya po radiatsionnoy khi-  
mii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962,  
507-510

TEXT: Investigations were carried out on samples of phosphonitrile  
chloride deposited on aluminum subjected to various doses of 1 -  
1.2 Mev electrons from an electron accelerator, at a temperature  
of about 130°C. Almost complete polymerization occurred with a  
dose of  $1.7 \times 10^{24}$  ev/g, in the presence of oxygen. Since partial  
volatilization of the  $(\text{PNCl}_2)_3$  occurred, owing to heating by ab-  
sorption of energy, similar experiments were carried out with  
 $(\text{PNCl}_2)_4$  in the absence of oxygen, but only at very high dosages  
was any significant polymerization observed. Experiments were car-  
Card 1/3

S/844/62/000/000/086/129  
D423/D307

Radiation polymerization of ...

ried out in addition on the action of radiation on the reaction of n-butyl alcohol with  $(\text{PNCl}_2)_4$ , which does not take place under normal conditions. A typical experiment was carried out using 80 ml of a 5% solution of  $(\text{PNCl}_2)_4$  in absolute n-butanol and irradiating in a glass cell for 6 hours with 0.6 Mev electrons and a dose of  $1.5 \times 10^{22}$  ev/ml. The temperature did not exceed 30°C. After analysis the product was found to correspond to phosphonitrile ether n-butanol. Atomic hydrogen liberated during the process was assumed to be responsible for the formation of monomer and dimer radicals and also HCl. Data obtained indicated that the chlorine content of the solution was reduced with increase of dosage. Further work was undertaken using a mixture of phosphonitrile chloride and calcium fluoride in tetrachlorethane. Analysis confirmed that mixed phosphonitrile halides were obtained, corresponding to the formula  $\text{P}_4\text{N}_4\text{FCl}_7$ . There are 2 tables.

ASSOCIATION: Institut fizicheskoy khimii AN SSSR, Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova, khi-

Card 2/3

Radiation polymerization of ...

S/844/62/000/000/086/129  
D423/D307

micheskoy fakul'tet (Institute of Physical Chemistry, AS  
USSR; Moscow State University im. M. V. Lomonosov, Fa-  
culty of Chemistry)

Card 3/3

S/844/62/000/000/110/129  
D207/D307

AUTHORS: Spitsyn, V. I. and Mikhaylenko, I. Ye.

TITLE: Radiation-chemical activation of the surface of solid potassium sulfate

SOURCE: Trudy II Vsesoyuznogo soveshchaniya po radiatsionnoy khimii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962, 642-645

TEXT: Potassium sulfate was activated with  $S^{35}$ . Increase of the activity of the sulfate altered the degree of isotope exchange in the system  $K_2SO_4-SO_3$ , which rose first to a maximum at the activity of  $2.3 \mu\text{c/g}$ , passed through a minimum at  $61 \mu\text{c/g}$  and then rose again. The degree of isotope exchange rose also with the duration of storage in spite of the reduction of radioactivity with time. External irradiation with electrons, equivalent to activities up to  $50 \mu\text{c/g}$ , did not produce the effects observed in  $S^{35}$ -activated  $K_2SO_4$ . The activated sulfate adsorbed more methanol than the un-

Card 1/2

S/844/62/000/000/110/129  
D207/D307

• Radiation-chemical activation ...

activated compound, indicating higher defect density at the surface; this conclusion was confirmed by electron microscopy. External irradiation with electrons produced lower surface defect density than did activation. The crystal structure and the particle size of  $K_2SO_4$  were not affected by activation. There are 4 figures and 1 table.<sup>4</sup>

ASSOCIATION: Institut fizicheskoy khimii AN SSSR (Institute of Physical Chemistry, AS USSR)

Card 2/2

S/844/62/000/000/111/129  
D207/D307

AUTHORS: Spitsyn, V. I. and Gromov, V. V.

TITLE: Effect of radiation on sorption properties of barium sulfate

SOURCE: Trudy II Vsesoyuznogo soveshchaniya po radiatsionnoy khimii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962, 646-650

TEXT: The adsorption of an aqueous solution of methylene blue on precipitated  $\text{BaSO}_4$  was reduced by activating the sulfate with  $\text{S}^{35}$  but it rose on adding radium ( $3.0 \times 10^{-7} \mu\text{c/g}$ ) to  $\text{BaSO}_4$ . The converse was found for the adsorption of an aqueous solution of acid orange on  $\text{BaSO}_4$ : radium strongly reduced the adsorption while the activation with  $\text{S}^{35}$  increased it. This behavior was due to the positive charging of  $\text{BaSO}_4$  surface by the  $\beta$  emission of  $\text{S}^{35}$  and the negative charging by the  $\alpha$  emission of radium. The charged surface of

Card 1/2

Effect of radiation ...

S/844/62/000/000/111/129  
D207/D307

the sulfate attracted preferentially the dye with the opposite charge (methylene blue and acid orange have oppositely charged dye ions). NaCl added to the dye solutions reduced the difference between the adsorption on activated and unactivated  $\text{BaSO}_4$ . When the  $\text{S}^{35}$ -activated  $\text{BaSO}_4$  was stored for 100 - 200 days, the adsorption of both dyes was not greatly affected because structural changes on the surface occurred immediately after activation; the observed small reduction of the adsorption with time was due to the 'polishing' effect of the  $\beta$  emission acting for a long time. A similar 'polishing' effect was found on irradiation of the unactivated  $\text{BaSO}_4$  with 800 kee electrons or 1.5 Mev protons, the effect being stronger for lower dose rates. There are 4 figures and 1 table.

ASSOCIATION: Institut fizicheskoy khimii AN SSSR (Institute of Physical Chemistry, AS USSR)

Card 2/2



TRAILINA, Ye.P.; SAVICH, I.A.; SPITSYN, V.I.

Investigating inner-complex compounds of a number of cations  
formed by Mannich bases. Trudy LVMI 19138-142 '62  
(MIRA 17:7)

SPITSYN, Vikt.I.; PIROGOVA, G.N.; MIKHAYLENKO, I.Ye.

Effect of ionizing radiation on the catalytic dehydration of n.dodecyl alcohol. Izv.AN SSSR.Otd.khim.nauk no.9:1515-1520 S '62. (MIRA 15:10)

1. Institut fizicheskoy khimii AN SSSR.  
(Dodecyl alcohol) (Dehydration (Chemistry)) (Ionization)

S/186/62/004/001/006/008  
E075/E436

AUTHORS: D. yachkova, R.A., Spitsyn, Vikt. I., Nazarov, F.P.

TITLE: Separation of protoactinium from zirconium, titanium and niobium by a chromatographic method

PERIODICAL: Radiokhimiya, v. 4, no. 1, 1962, 89-94

TEXT: The authors investigated purification of protoactinium from the admixtures of niobium, titanium and zirconium using some anion-exchanger resins and  $MnO_2$ . The work was carried out with  $Pa^{233}$ . The resins used were AB-16 (AV-16), AE-17 (AV-17) and AH-20 (AN-2F) in the  $Cl^-$  form. Active  $MnO_2$  was prepared by the generally accepted method described by Ye.V. Alekseyevskiy (Ref. 12). The separations on the resins were carried out in hydrochloric acid solutions which were found to be the best for Dowex-1 resin (Ref. 8). 7 N HCl containing 0.9 mg/ml Zr and also indicator quantities of  $Nb^{95}$  and  $Pa^{233}$  were passed through a column of 0.5 cm diameter, 9 cm high, filled with 40 to 60 mesh resin. Solution flow was 0.2 ml/cm<sup>2</sup>/min. With resins AV-17 or AN-2F, it was possible to separate 85 to 90% of Zr, which appeared in the first portions of eluant. Nb appeared in the eluate only slightly.

Card 1/2

S/186/62/004/001/006/008  
E075/E436

# Separation of protoactinium

before Pa. For resin AV-16, Nb and Pa were eluted almost at the same time. MnO<sub>2</sub> was tried next for the separation of Nb and Pa. The authors determined distribution coefficients of Nb and Pa between MnO<sub>2</sub> and 0.5 N NH<sub>4</sub>F for a wide range of concentrations of hydroxyl ions. The distribution coefficients were found to depend on these concentrations. The dependence was not great at pH < 3 but was marked for Nb at pH > 4. Thus the use of concentrated NH<sub>4</sub>F solution as an eluent at the pH of 5.2 gives a considerable degree of separation between Nb and Pa. 80% of Pa was eluted at the time of appearance of Nb in the eluate. It was found, however, that an increase in temperature decreases the degree of separation. To decrease undesirable hydrolytic processes the separation was carried out in the acid medium, although it was expected that in neutral solutions the separation would be more complete. The number of theoretical plates for the column and method used (0.5 N HNO<sub>3</sub> + 0.2 N NH<sub>4</sub>F solution used as eluent, MnO<sub>2</sub> column height 35 cm, diameter 0.4 cm, rate of flow of solution 0.1 ml/cm<sup>2</sup>/min) was found to be 920 and the height equivalent to theoretical plate 0.38 mm. There are 6 figures and 2 tables.

SUBMITTED February 22, 1961  
Card 2/2

BELIAKOVA, L.D.; GROMOV, V.V.; KISELEV, A.V.; SPITSYN, Vikt.I.

Adsorption of various substances on radioactive samples  
of barium sulfate. Radiokhimiya 4 no.4:410-421 '62.  
(MIRA 15:11)

(Barium sulfate) (Sulfur—Isotopes)  
(Adsorption)

SAVICH, I.A.; PIKAYEV, A.K.; LEBEDEV, B.G.; KUZ'MICHEVA, Ye.U.;  
SPITSYN, Vikt.I.

Certain properties of chelate-type salts of uranyl with Schiff bases.  
Zhur.neorg.khim. 7 no.3:498-509 Mr '62. (MIRA 15:3)

1. Moskovskiy gosudarstvennyy universitet imeni M.V.Lomonosova,  
kafedra neorganicheskoy khimii i Institut fizicheskoy khimii  
AN SSSR.

(Uranyl salts)

(Schiff bases)

S/078/62/007/010/001/008  
B144/B186

AUTHORS: Shatskiy, V. M., Kommissarova, L. N., Spitsyn, Vikt. I.

TITLE: Precipitation of scandium hydroxide and oxalate

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 7, no. 10, 1962, 2294-2298

TEXT: 1) Effects of Sc concentration, nature and quantity of precipitant, and the influence of  $\text{NH}_4\text{Cl}$  on the precipitation degree of  $\text{Sc}(\text{OH})_3$  were studied in the concentration range of 1 - 60 g/l  $\text{Sc}_2\text{O}_3$ , with  $\text{NH}_4\text{Cl}$  additions of 50 - 150 g/l. The precipitants used were 10% and 25% solutions of  $\text{NH}_4\text{OH}$  and  $\text{NaOH}$  with no  $\text{CO}_2$ . Their content in the filtrate was 10 - 125 g/l. The pH was varied from 6.5 to 9.5. With  $\text{NH}_4\text{OH}$ , precipitation was 100% in concentration intervals from 1 to 30 mg/ml  $\text{Sc}_2\text{O}_3$ , and 98.7% in the concentration 60 mg/ml  $\text{Sc}_2\text{O}_3$ . The  $\text{Sc}(\text{OH})_3$  precipitation was slightly reduced (99.7%) with high  $\text{NaOH}$  excess. In both cases, the  $\text{Sc}_2\text{O}_3$  content in the filtrate did not exceed 1 mg/l. This

Card 1/2

Precipitation of scandium...

S/078/62/007/010/001/008  
B144/B186

holds equally for precipitation from nitric solutions containing 40 - 50% of rare-earth elements, 20% Th and 5% Sc (as calculated for oxides) and small amounts of Fe, Al, Mg, and Ca. 2) Degree of precipitation of Sc oxalate was studied as a function of relative concentrations of  $\text{Sc}_2\text{O}_3$  and  $\text{H}_2\text{C}_2\text{O}_4$ . Precipitation from solutions containing 5 g/l  $\text{Sc}_2\text{O}_3$  is 97%, and there is no influence of the precipitant within 100 - 300%. The precipitation degree exceeds 99.6% when the initial solution contains 50 - 100 g/l  $\text{Sc}_2\text{O}_3$ . In precipitation from 1 g/l  $\text{Sc}_2\text{O}_3$  solutions, the precipitation rate decreases from 88.9 to 58.1% in dependence of the  $\text{H}_2\text{C}_2\text{O}_4$  excess. If water (at 25°C) is used as a washing liquid the Sc content is 65 - 150 mg/l  $\text{Sc}_2\text{O}_3$ . Deviations from the results obtained by R. C. Vickery (J. Chem. Soc. (London), 3113 (1956)) are explained by inadequate radiometric analysis methods. There are 2 figures and 2 tables.

SUBMITTED: January 18, 1962

Card 2/2



TSIREL'NIKOV, V.I.; KOMISSAROVA, L.N.; SPITSYN, Vikt.I.

Corroding effect of zirconium tetrachloride vapors on 1Kh13N9T  
steel and nickel at high temperatures. Atom. energ. 13 no.1:  
51-53 J1 '62. (MIRA 15:7)

(Corrosion and anticorrosives)

SPITSYN V.I.

SZPICIN, V.I. [~~Spitsin, V.I.~~]; TUDOS, Ferenc [translator]

Present state of chemical sciences and their long-range development in the Soviet Union. Kem tud kozl MTA 18 no.2:173-219 '62.

1. A. Szovjetunio Tudomanyos Akademiaja Fizikai Kemiai Intezete, Moscow, es Lomonoszov Egyetem, Moscow (for Spitsin). 2. "A Magyar Tudomanyos Akademia Kemiai Tudomanyok Osztalyanak Kozlemenyei" szerkeszto bizottsagi tagja (for Tudos).

SZPICIN, V.I. [Spitsin, V. I.]; TUDOS, Ferenc [translator]

The present-day situation and long-range development of chemical sciences in the Soviet Union. Kem tud kozl MTA 18 no.2:173-219 '62.

1. A Szovjetunio Tudomanyos Akademiaja Fizikai Kemiai Intezete, Moszkva, es Lomonosov Egyetem, Moszkva. 2. "A Magyar Tudomanyos Akademia Kemiai Tudomanyok Osztalyanak Kozlemenyei" szerkeszto bizottsagi tagja (for Tudos).

SZPICIN, V.I. [Spitsin, V.I.]; TUDOS, Ferenc [translator]

New data on the effect of the radioactive radiation of solid bodies, as well as of external radiation on certain heterogeneous chemical processes. Kem tud kozl MTA 18 no.2: 301-321 '62.

1. Szovjetunio Tudomanyos Akademiaja Fizikai-kemiai Intezete, Moscow, es Lomonosov Egyetem, Moscow (for Spitsin). 2. "A Magyar Tudomanyos Akademia Kemiai Tudomanyok Osztalyanak Kozlemenyei" szerkeszto bizottsagi tagja (for Tudos).

SPITSYN, Vikt.I., akademik; MIKHAYLENKO, I.Ye.; PIROGOVA, G.N.

Effect of ionizing radiation on the catalytic activity of  
aluminum oxide in the dehydration of dodecyl alcohol. Dokl.  
AN SSSR 143 no.5:1152-1155 Ap '62. (MIRA 15:4)

1. Institut fizicheskoy khimii AN SSSR.  
(Dodecyl alcohol) (Dehydration) (Aluminum oxide)  
(Ionization)

37359

S/020/62/143/006/023/024  
B101/B110

128300  
AUTHORS:

Spitsyn, Vikt. I., Academician, Yandushkin, K. N., Balezin, S. A., and Kuleshov, I. M.

TITLE:

Study of the atmospheric corrosion of radioactive Armco iron and steel-2 specimens

PERIODICAL:

Akademiya nauk SSSR. Doklady, v. 143, no. 6, 1962, 1406-1408

TEXT: The effect of  $Fe^{59}$  ( $T_{1/2} = 45.1$  days;  $\beta$ :  $E_{max} = 0.27; 0.46; 1.56$  Mev;  $\gamma$ :  $E = 0.19; 1.10; 1.29$  Mev) on Armco iron and carbon steel-2 of the following composition was studied:

	C	Mn	Cr	S	P	Ni	Si
Armco iron	0.04	0.017	traces	0.020	0.010	0.18	0.2
steel-2	0.17	0.44	0.3	0.025	0.028	traces	0.24

The specimens were irradiated with slow neutrons in a nuclear reactor ( $0.87 \cdot 10^{13}$  neutrons/cm<sup>2</sup>.sec) for 48 hrs. . The induced radioactivity  
Card 1/3

S/020/62/143/006/023/024  
B101/B110

Study of the atmospheric corrosion ...

was 0.22 mCu/g. Corrosion was determined from the increase in weight at 23 - 25°C in air with 100% relative humidity, and compared with the corrosion of non-irradiated specimens. It was found that irradiation increased the corrosion rate considerably: The corrosion rate of Armco-iron specimens with a specific radioactivity of 0.2 mCu/g was increased by 176 times, and that of steel-2 specimens by 103 times. The increase in corrosion rate is particularly strong within the first 24 hrs. Furthermore, the corrosion rate was found to depend on the specific activity (Fig. 3). Grounding of the irradiated specimens in order to avoid anodic polarization by  $\beta$ -irradiation reduced corrosion but did not remove the irradiation effect. The presence of  $\gamma$ -FeOOH containing small impurities of  $\alpha$ -FeOOH and  $Fe_2O_4$  in the corrosion products of both specimens was revealed by X-ray photography. Atmospheric corrosion of iron is attributed to: (a) increased ionic conductivity of the oxide film as a result of lattice defects and distortions; or (b) to increased conductivity as a result of the transition of additional electrons into the conduction band, whereby the cathodic reaction is facilitated. There are 3 figures.

Card 2/4

Study of the atmospheric corrosion ...

S/020/62/143/006/023/024  
B101/B110

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute of Physical Chemistry of the Academy of Sciences USSR);  
Moskovskiy gosudarstvennyy pedagogicheskiy institut im.  
V. I. Lenina (Moscow State Pedagogical Institute imeni  
V. I. Lenin).

SUBMITTED: January 11, 1962

Fig. 3. Corrosion of Armco iron and steel-2 as a function of specific activity. (1) Armco iron; (2) steel-2; Legend: abscissa: specific activity, mCu/g; ordinate: increase in weight.

X

Card 3/4



SPITSYN, V.I.

37519  
S/020/62/144/001/017/024  
B119/3144

AUTHORS: Men'kov, A. A., Komissarova, L. N., Karolin, V. V.,  
Priselkov, Yu. A., Nesmoyanov, An. N., and Spitsyn, Vikt. I.,  
Academician

TITLE: Investigation of high-purity metallic scandium

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 144, no. 1, 1962, 122 - 125

TEXT: 99.5% pure Sc was produced by high-vacuum distillation of 97 - 97.5% Sc. The pure metal was studied metallographically and tested for its behavior to  $O_2$ ,  $N_2$  (in a device designed by R. D. Shapovalova and ... A. Vasil'yeva), and differently concentrated solutions of  $HCl$ ,  $H_2SO_4$ ,  $HNO_3$ , and  $NaOH$  at 25, 50, and 100°C. The results were compared with those obtained for 97% Sc. The polished, non-etched surface of 97% Sc reveals the grain boundaries in polarized and nonpolarized light. No second phase appears in spite of 0.9% oxygen content. With high-purity Sc, the grain boundaries are only visible in polarized light. 99.5% Sc starts reacting at 200°C with  $O_2$ , at more than 600°C with  $N_2$  (formation of  $ScN$ ). Dissolving

Card 1/2

2

S/020/62/144/001/017/024  
B119/B144

Investigation of high-purity...

tests with the agents mentioned were made under conditions effecting a reaction of zero order. The dissolution rate constant for Sc of both degrees of purity was  $0.75 \text{ mg} \cdot \text{l} \cdot \text{cm}^{-2} \cdot \text{min} \cdot \text{g}^{-1}$  at  $25^\circ\text{C}$  for  $\text{H}_2\text{SO}_4$  and  $\text{HCl}$ , and  $0.015$  for  $\text{HNO}_3$ . According to calculations, the activation energy of the dissolving process was  $9.0 \pm 0.2 \text{ kcal/g-eq}$ . Sc reacts very slowly with  $\text{NaOH}$  solutions of more than  $10\%$ . From  $97 - 99.5\%$ , the purity of the sample has a much stronger effect on the physical than on the chemical properties of Sc. There are 4 figures and 2 tables. The most important English-language reference is: P. H. Spedding, A. H. Daane, G. Warkefield, D. H. Bennison, Trans. Metallurg. Soc. AIME, 218, no. 4, 608 (1960).

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova  
(Moscow State University imeni M. V. Lomonosov)

SUBMITTED: January 12, 1962

Card 2/2

BARSOVA, L.I.; PIKAYEV, A.K.; SPITSYN, Vikt.I., akademik; BALANDIN, A.A.,  
akademik

Radiolysis of aqueous solutions of certain rhodium compounds.  
Dokl.AN SSSR 144 no.2:344-346 My '62. (MIRA 15:5)

1. Institut fizicheskoy khimii AN SSSR i Moskovskiy gosudarstvennyy  
universitet im. M.V.Lomonsova.  
(Rhodium compounds) (Radiation)

S/020/62/144/003/025/030  
B124/B101

AUTHORS: Spitsyn, Vikt. I., Academician, Balandin, A. A., Academician,  
~~Barsova, L. I., and Pikayev, A. K.~~

TITLE: Radiochemistry of aqueous solutions of bivalent palladium  
salts

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 144, no. 3, 1962, 588-591

TEXT: The radiolytic reduction of aqueous solutions of 0.1-0.001 M palladous chloride (I), 0.01-0.001 M potassium tetrachloropalladate (II), 0.03 M palladous sulfate (III), and 0.01-0.001 M palladous nitrate (IV) by 0.7-0.9 Mev electrons from a direct-acceleration electron tube has been studied. Irradiation of I, II, III, gives palladium black and irradiation of IV gives palladous hydroxide. The radiochemical yields of palladium were determined by measuring the optical density of the solutions (Fig. 1) at 415 mμ as a function of the time of radiation, with parallel weighing of the precipitated metal. The respective curves were used to determine the radiochemical yield, G(-Pd<sup>2+</sup>), of reduced Pd<sup>2+</sup>. The yield of palladium black, G(Pd), obtained with various radiation doses is determined

Card 1/4

S/020/62/144/003/025/030  
5124/3101

Radiochemistry of aqueous ...

from the slope of the curves (Fig. 2).  $G(\text{Pd})$  and  $G(-\text{Pd}^{2+})$  are generally found to increase with decreasing dose rate absorbed, and to be dependent, moreover, on the concentration of the irradiated solution in some way. The reduction of (I) to metallic palladium is incomplete in the presence of palladium black and added metallic palladium (0.0018 g Pd in 8 ml solution) which is probably due to its interaction with the OH radicals and chloride ions present leading to the formation of  $\text{Pd}^{2+}$  and  $[\text{PdCl}_4]^{2-}$ .

ions and to an increased acidity of the solutions. The relation  $G(\text{Pd}) = G_{\text{H}_2\text{O}} + (1/2)[G_{\text{H}} - G_{\text{OH}}]$  (10) is derived. The experimental results

of  $G(\text{Pd})$  being somewhat lower is explained by the partial sorption of atomic and molecular hydrogen formed by hydrolysis of the palladium black, and by the partial decomposition of  $\text{H}_2\text{O}_2$  by palladium. In aqueous solutions of (IV), the formation of  $\text{PdO} \cdot x\text{H}_2\text{O}$  is probably due to an increase in the pH as a result of radiation. There are 3 figures and 1 table.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute of Chemical Physics of the Academy of Sciences USSR);  
Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova  
(Moscow State University imeni M. V. Lomonosov)

Card 2/4

Radiochemistry of aqueous ...

S/020/62/144/003/025/030  
3124/B101

SUBMITTED: January 29, 1962

Fig. 1. Change of the optical density (at 415 mμ) of a 0.01 M solution of palladous chloride in dependence on the time of radiation ( $D_0$  being the optical density of the original solution and  $D$  that of the irradiated solution). Dose rates (ev/ml·sec): (1)  $8.6 \cdot 10^{10}$ ; (2)  $9 \cdot 10^{17}$ ; (3)  $9 \cdot 10^{18}$ . Legend: (A) min.

Fig. 2. Dependence of the amount of precipitated metallic palladium on the time of radiation for a 0.1 M solution of palladous chloride (the volume of the solution being 8 ml). Dose rate (ev/ml·sec): (1)  $8.6 \cdot 10^{17}$ ; (2)  $8.6 \cdot 10^{18}$ . Legend: (A) g; (B) min.

Card 3/4

KUZINA, A.F.; ZHDANOV, S.I.; SPITSYN, Vikt.I., akademik

Polarography of technetium in perchlorate solutions. Dokl.  
AN SSSR 144 no.4:836-839 Je '62. (MIRA 15:5)

1. Institut fizicheskoy khimii AN SSSR.  
(Technetium) (Polarography)

38613

S/020/62/144/005/010/017  
B106/B138

21,4200  
AUTHORS:

Spitsyn, Vikt. I., Academician, Kuzina, A. F.,  
Zamoshnikova, N. N., and Tagil', T. S.

TITLE:

Extraction of technetium 99 from aqueous solutions with  
quinoline, tributyl phosphate, and some other organic solvents

PERIODICAL:

Akademiya nauk SSSR. Doklady, v. 144, no. 5, 1962, 1066-1068

TEXT: The authors were the first to study the extraction of technetium at  
room temperature with the following organic solvents: quinoline, tributyl  
phosphate (TBP), acetone, acetylacetone, and thenoyl trifluoro acetone  
 $C_6H_5O_2F_3S$  (0.2 M solution in benzene). They also studied the extraction of  
the complex compound of technetium and triphenyl guanidine chloride with  
n-butanol and chloroform. For comparison, the complexes of technetium with  
tetraphenyl arsonium chloride, and tetraphenyl phosphonium chloride with  
chloroform were also extracted. The long-lived isotope  $Tc^{99}$  in the form  
of pure 6-8 mg/l solutions of sodium pertechnate used for the extraction.  
In addition, the sodium pertechnate solution was oxidized with  $H_2O_2$  in an

Card 1/3



S/020/62/144/005/010/017  
B106/B138

# Extraction of technetium 99 ...

alkaline medium before each extraction. The extraction of technetium was observed radiometrically. It was found that pure  $Tc^{99}$  can easily be extracted from neutron-bombarded molybdenum by quinoline and acetone. The results for technetium extraction with acetone will be published separately. With quinoline, the highest distribution coefficient ( $K = 83$ ) was reached at  $pH = 8$ . When technetium was reextracted, neither distillation of quinoline in vacuo, extraction with 0.2 M aqueous solutions of hydrazine sulfate or sodium thiosulfate, nor precipitation of technetium as  $CsTcO_4$  or  $RbTcO_4$  showed satisfactory results. Reextraction is possible if chloroform is added (in an amount equal to that of quinoline) to the system quinoline - water, 99.7% technetium passing into the aqueous phase. The extraction of technetium with TBP was studied in the acidity range 1 N NaOH to  $>6$  N  $HNO_3$ . Highest K value, 14.7, was obtained with 0.5 N  $HNO_3$  as medium, with this acidity, the composition of the extractable complex corresponds to the formula  $HTcO_4 \cdot 3TBP$ . Reextraction from the organic layer, was studied with water, HCl,  $HNO_3$ , and NaOH solutions of different concentrations, 4 N solutions of citric and oxalic acids, and

Card 2/3

of the Academy of Sciences USSR (Institute of

SUBMITTED: January 30, 1962

Card 3/3

S/020/62/145/001/014/018  
B145/B101

AUTHORS: Kuzina, A. F., Tagil', T. S., Zamoshnikova, N. N., and  
Spitsyn, Vikt. I., Academician

TITLE: Extraction of technetium 99 by acetone

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 145, no. 1, 1962, 106 - 108

TEXT: It was found that acetone in an aqueous medium is salted out by  $\text{Na}_2\text{MoO}_4$  and NaOH (the best conditions being: 200 g  $\text{Na}_2\text{MoO}_4$ /l, with 5N NaOH; increase in the acetone volume at a phase ratio of 1:1 not more than 5 %).  $\text{Tc}^{99}$  can be extracted selectively from alkaline aqueous solutions with acetone in the presence of other radioelements. The optimum NaOH concentration (1 ml acetone, 1 ml alkaline phase, 10.2 mg/l Tc as pertechnetate, time of extraction : 5 minutes, 25 - 27°C) was 4 - 5 moles/l with a distribution factor  $K = 10$  (92 % extracted). In the presence of 75 g/l  $\text{Na}_2\text{MoO}_4$ ,  $K$  was 8 with 4 N NaOH (90 %) and 10 with 5 N NaOH (91 %). When the phase ratio was changed by one order of magnitude, the degree of extraction remained practically constant. Reaction solutions obtained by

Card 1/2

S/020/62/145/001/014/018  
B145/B101

Extraction of technetium 99 ...

neutron bombardment of  $\text{Na}_2\text{MoO}_4$  were extracted with acetone (2 - 3 N NaOH,

V aqueous phase: V organic phase = 2 : 1, time of extraction: 5 - 10 minutes ) giving radiochemically pure  $\text{Tc}^{99}$  ( $\beta$  -  $\gamma$  spectrum analysis: 290  $\pm$  10 kev end-point energy). There are 2 figures and 4 tables. The English-language reference is: S. L. Taimuty, Phys. Rev., 81, 461 (1951). ✓

SUBMITTED: February 10, 1962

Card 2/2

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40185  
S/020/62/145/005/016/020  
B106/B144

AUTHORS: Tsirel'nikov, V. I., Komissarova, L. N., and Spitsyn, Vikt. L.  
Academician

TITLE: Study of vapor density of hafnium tetrachloride at high temperatures

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 145, no. 5, 1962, 1081-1084

TEXT: The vapor density of hafnium tetrachloride was determined at high temperatures with the aid of the radioisotope  $Hf^{181}$  following a method described by F. S. Dainton, H. M. Kimberley (Trans. Farad. Soc., 46, 912 (1950)) and V. V. Illarionov, S. A. Cherepanova (DAN, 133, 1086 (1960)). The tagged  $HfCl_4$  contained 0.3%  $ZrCl_4$  and <0.001% Fe, Ti, Si, Al. Iso-

thermal and isobaric studies were carried out. The radiometric measurements were made whilst heating and cooling, and the resulting values showed good agreement (Fig. 3). The experimental setup consisted of two electric furnaces arranged at right angles. The vessels in the furnaces were joined by a capillary tube heated to 550°C; of such size that no noticeable pressure drop occurred. In the isothermal measurements, the

Card 1/3

Study of vapor density ...

S/020/62/145/005/016/020  
B106/B144

40

first furnace was kept at constant temperatures between 400 and 1000°C and the temperatures in the second furnace were varied between 280 and 350°C, whereas in the isobaric tests, those temperatures were varied in the first and kept constant in the second furnace. The error of measurement was  $\pm 2.5\%$ . At high temperatures and low pressures, the hafnium tetrachloride vapor follows the ideal gas laws if it is assumed to be monomolecular. According to data of W. Fisher (Zg. anorg. u. allgem. Chem., 211, 321 (1933)), zirconium tetrachloride vapor behaves analogously. At a pressure increase above atmospheric pressure and a temperature decrease to near sublimation temperature, the vapor density of the real  $\text{HfCl}_4$  vapor is as much as 10% lower than the ideal vapor density. This deviation cannot be explained by association, but by the nonideality of the vapor near condensation temperature. The data obtained are required for calculating technological processes to separate zirconium and hafnium tetrachlorides in the gaseous state. There are 3 figures and 2 tables. The most important English-language reference is: A. A. Palko, A. D. Ryon, D. W. Kuhn, J. Am. Chem. Soc., 62, 319 (1958).

Card 2/3

Study of vapor density ..

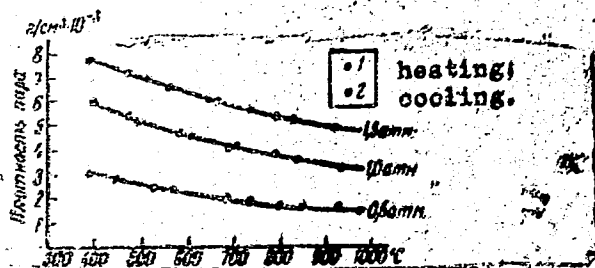
S/020/62/145/005/016/020  
B106/B144

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova  
(Moscow State University imeni M. V. Lomonosov)

SUBMITTED: April 4, 1962

Fig. 3. Temperature dependence of the vapor density of  $\text{HfCl}_4$  at constant pressure.

Legend: ordinate -- vapor density,  $\text{g/cm}^3 \cdot 10^{-3}$ ;



Card 3/3

YEVDOKIMOV, V.B.; ZELENTSOV, V.V.; KOLLI, I.D.; TAM VEN'-SYA; SPITSYN,  
Vikt.I., akademik

Magnetic susceptibility and stereochemistry of complex compounds  
of Mo (III) with urea, thiourea, and their derivatives. Dokl.AN  
SSSR 145 no.6:1282-1284 Ag '62. (MIRA 15:8)

1. Moskovskiy gosudarstvennyy universitet im. M.V.Lomonosova.  
(Molybdenum compounds—Magnetic properties) (Urea)

S/020/62/146/001/013/016  
B101/B144

AUTHORS: Tsirel'nikov, V. I., Komissarova, L. N., and Spitsyn, Vikt. I., Academician

TITLE: Study of the thermal stability of the molecules of zirconium and hafnium tetrahalides on collision with a hot surface in vacuo

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 146, no. 1, 1962, 122 - 124

TEXT: The decomposition coefficients of Zr and Hf tetrahalides excepting the fluorides were determined. The tetrahalides were heated in an ampoule with capillary outlets (Fig. 1) so that the effusion followed the Knudsen cosine law. The molybdenum target was heated to 1000 - 1500°C and the samples evaporated in vacuo at  $10^{-6}$  mm Hg. On dissolving the target in  $\text{HNO}_3$  the Zr or Hf was precipitated as metallic film, and weighed. Spectrum analysis showed a slight diffusion of Mo from the target into Zr or Hf. The amount of Zr or Hf precipitated and that of tetrahalide evaporated were used to calculate the decomposition coefficient  $K_d$ . At 1500°C this

Card 1/3



Study of the thermal stability...

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B101/B144

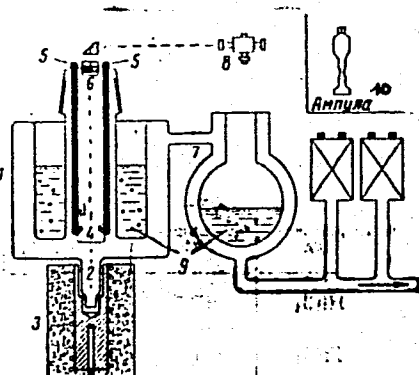


Fig. 1

Card 3/3

Study of the thermal stability...

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B101/B144

was 100% for  $ZrI_4$ , 90% for  $HfI_4$ , 68% for  $ZrBr_4$ , 61% for  $HfBr_4$ . There was almost no dissociation in the case of the tetrachlorides.  $K_d$  is proportional to the target temperature. The thermal stability of Zr and Hf tetrahalides corresponds to their formation enthalpies. There are 2 figures and 2 tables.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova  
(Moscow State University imeni M. V. Lomonosov)

SUBMITTED: March 26, 1962

Fig. 1. Apparatus for determining  $K_d$  of Zr and Hf tetrahalides.

Legend: (1) Apparatus, (2) extension of the ampoule, (3) heater, (4) molybdenum target, diameter 12-15 mm, thickness 0.5 mm, (5) molybdenum lead-in, (6) sight hole, (7) trap, (8) pyrometer, (9) liquid nitrogen, (10) ampoule.

Card 2/3

SPITSYN, VIKT, I., akademik; BALANDIN, A.A.. akademik; MIKHAYLENKO, I.Ye.;  
DOBROSEL'SKAYA, N.P.

Dehydration of isopropyl alcohol on a radioactive tricalcium phosphate  
catalyst. Dokl. AN SSSR 146 no.5:1128-1131 C '62. (MIRA 15:10)

1. Institut fizicheskoy khimii AN SSSR.  
(Isopropyl alcohol) (Dehydration (Chemistry)) (Calcium phosphate)

YANDUSHKIN, K.N.; BALEZIN, S.A.; SPITSYN, Vikt.I., akademik

Electrode potentials of radioactive specimens of Armco iron and steel-2 in distilled water and in aqueous solutions of inhibitors. Dokl. AN SSSR 147 no.1:155-158 N '62. (MIRA 15:11)

1. Institut fizicheskoy khimii AN SSSR i Moskovskiy gosudarstvennyy pedagogicheskiy institut im. V.I. Lenina.  
(Iron—Corrosion) (Radioactivity)  
(Electromotive force)

SPITSYN, Vikt.I., akademik; GROMOV, V.V.

Effect of the radioactive radiation of the solid phase on the  
kinetics of potassium sulfate recrystallization. Dokl. AN SSSR  
147 no.3:663-666 N '62. (MIRA 15:12)

1. Institut fizicheskoy khimii AN SSSR.  
(Potassium sulfate) (Crystallization) (Radiation)

VERESHCHINSKIY, Igor' Vyacheslavovich; PIKAYEV, Aleksey Konstantinovich;  
SPITSYN, Vikt. I., akademik, otv. red.; DRAGUNOV, E.S., red.;  
YENIFANOVA, L.V., tekhn. red.; YEGOROVA, N.F., tekhn. red.

[Introduction to radiation chemistry] Vvedenie v radiatsion-  
nuiu khimiiu. Moskva, Izd-vo Akad. nauk SSSR, 1963. 406 p.  
(MIRA 16:5)

(Radiochemistry)

AMBARTSUMYAN, V.A., akademik; ASRATYAN, E.A.; BOGOLYUBOV, N.M., akademik; VINOGRADOV, A.P., akademik; GINETSINSKIY, A.G.; KHULYANTS, I.L., akademik; KOCHETKOV, M.K.; KURSANOV, A.L., akademik; MEL'NIKOV, O.A.; NESMEYANOV, A.N., akademik; NESMEYANOV, An.N., doktor khim. nauk; OBREIMOV, I.V., akademik; POLIVANOV, M.K., kand.fiz.-mat.nauk; REUTOV, O.A.; RYZHKOV, V.L.; SPITSIN, V.I., akademik; TAMM, I.Ye., akademik; FESENKOV, V.G., akademik; FOK, V.A., akademik; SHCHERBAKOV, D.I., akademik; FRANK, I.M.; FRANK, G.M.; KHOKHLOV, A.S., doktor khim. nauk; SHEMYAKIN, M.M., akademik; ENGEL'GARDT, V.A., akademik; SHAPOSINIKOV, V.N., akademik; BOYARSKIY, V.A.; LIKHTENSHTEYN, Ye.S.; VYAZEMTSEVA, V.N., red.izd-va; KILYAYS, Ye.N., red.izd-va; TARASENKO, V.M., red.izd-va; POLYAKOVA, T.V., tekhn. red.

[As seen by a scientist: From the Earth to galaxies, To the atomic nucleus, From the atom to the molecule, From the molecule to the organism] Glazami uchenogo: Ot Zemli do galaktik, K iadru atoma domolekuly, Ot molekuly do organizma. Moskva, Izd-vo AN SSSR, 1963. 736 p. (MIRA 16:12)

1. Akademiya nauk SSSR. 2. Chlen-korrespondent AN SSSR (for Asratyan, Ginetsinskiy, Kochetkov, Mel'nikov, Reutov, Ryzhkov, Frank, I.M., Frank, G.M.) (Astronomy) (Nuclear physics) (Chemistry) (Biology)

L 38500-65 EPF(c)/EWP(t)/EPF(n)-2/EWT(m)/EWP(b) Pr-4/Pu-4 IJP(c) GG/JW/JD/  
 SG/GS S/0000/63/000/000/0032/0040 33  
 32  
 B+1

ACCESSION NR: AT5007723

AUTHOR: Spitsyn, V. I.; Zimakov, I. Ye.

TITLE: Influence of radioactivity on the processes of vaporization of solids

SOURCE: AN SSSR, Institut khimii silikatov. Silikaty i okisly v khimii vysokikh temperatur (Silicates and oxides in high-temperature chemistry). Moscow, 1963, 32-40

TOPIC TAGS: vaporization, radioisotope evaporation, molybdenum anhydride, beta radiation, specific surface

ABSTRACT: The study was carried out on molybdenum anhydride ( $\text{MoO}_3$ ) into which the isotope  $\text{Mo}^{99}$  had been introduced. When the vaporization rates of radioactive and nonradioactive  $\text{MoO}_3$  were measured, it was found that the vaporization rate of radioactive  $\text{MoO}_3$  changes with the level of radioactivity and differs substantially from that of nonradioactive samples. It was postulated that the beta particles emitted by the radioisotope give rise to positive charges on the surface of the solid  $\text{MoO}_3$ , that the vaporizing molecules are surrounded by negatively charged oxygen atoms, and that their interaction with the positively charged points on the

Card 1/2



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ACCESSION NR: AT5007723

solid surface retards the vaporization process. This was confirmed by experiments in which the electric charges were allowed to dissipate by grounding with a platinum wire. The surfaces of  $\text{MoO}_3$  samples were studied by means of the electron microscope and the specific surface was measured by the adsorption of krypton (BET method). Changes in surface were found to have an appreciable effect on the vaporization rate. The influence of the radioisotopes  $\text{Y}^{90}$  and  $\text{W}^{185}$  on the vaporization rate of  $\text{MoO}_3$  was also studied, and certain similarities in behavior were observed. Thus, the kinetics of vaporization of the radioactive solids were found to depend on their radioactivity and on the radiation energy of the radioactive admixture introduced. "The specific surface measurements were carried out with the cooperation of N. P. Dobrosel'skaya." Orig. art. has: 6 figures.

ASSOCIATION: None

SUBMITTED: 0000063

ENCL: 00

SUB CODE: \*C, NP

NO REF SOV: 010

OTHER: 000

Card 2/2 *mvb*

5.4000

45327  
8/030/63/000/001/001/013  
B101/B102

AUTHOR: Spitsyn, V. I., Academician

TITLE: New problems in radiochemistry

PERIODICAL: Akademiya nauk SSSR. Vestnik, no. 1, 1963, 11 - 15

TEXT: This is a report on papers of the laboratoriya radiokhimii Instituta fizicheskoy khimii Akademii nauk SSSR (Laboratory of Radiochemistry of the Institute of Physical Chemistry of the Academy of Sciences USSR) showing that the physicochemical properties of radioactive preparations differ from those of preparations made up of the corresponding non-radioactive isotopes. The effect which the radioactivity of a  $\text{BaSO}_4$  precipitate exerts on its electrokinetic potential  $\xi$  as found by Ye. A. Torchenkova and I. N. Glaskova is mentioned. Various amounts of  $\text{S}^{35}$  were introduced into  $\text{BaSO}_4$  (particle size 1 -  $5\mu$ ) by interaction of  $\text{Na}_2\text{SO}_4$  with  $\text{BaCl}_2$ .  $\xi$  of nonradioactive  $\text{BaSO}_4$  was +7.8 mv; at a radioactivity of 0.7  $\mu\text{curie/g}$   $\text{BaSO}_4$ ,  $\xi$  was -8.1, at 2.4  $\mu\text{curie/g}$  it was -10.8, and at 10  $\mu\text{curie/g}$  it was -17.2 mv. Addition of

Card 1/3

New problems in radiochemistry

S/030/63/000/001/001/013  
B101/B102

$Ba^{2+}$  ions to the saturated solution of  $BaSO_4$  made  $\zeta$  of the non-radioactive precipitate more positive and changed  $\zeta$  of the radioactive precipitate from a negative to a positive value; this, however, was lower than that of non-radioactive  $BaSO_4$ . Addition of  $SO_4^{2-}$  ions made  $\zeta$  of the non-radioactive precipitate negative, and that of the radioactive precipitate more negative. V. V. Gromov found that an NaCl addition of 0.1 g/l eliminates the difference between the adsorption of methylene blue and acidio orange by radioactive and by non-radioactive  $BaSO_4$ . I. Ye. Mikhaylenko found that the melting points of  $Na_2SO_4$  and  $Na_2WO_4$  and the phase transition point  $T_{ph}$  of  $Na_2SO_4$  are lowered by irradiation in the uranium reactor.

"	$\mu\text{curie/g}$	$T_{ph}, ^\circ\text{C}$	m.p., $^\circ\text{C}$
$Na_2SO_4$	-	248	884
"	0.2	246	880
"	0.3	244	878
$Na_2WO_4$	-	595	700
"	0.33	595	695
"	2.4	595	692
Card 2/3			

New problems in radiochemistry

S/030/63/000/001/001/013  
B101/B102

It will be the task of radiochemistry to find new ways of improving the properties of catalysts, sorbents, activators of vaporization, etc. There are 3 figures and 2 tables.

✓

Card 3/3